A BUILDING STRUCTURE AND A METHOD OF FORMING A BUILDING STRUCTURE

Technical Field

The present invention relates to a building structure and to a method of forming a building structure, in particular to a building structure and method that provides improved waterproofing properties in the building structure.

Background Art

Larger structures which are built on inground foundations are notoriously difficult to waterproof and current procedures that are used to provide waterproofing require peripheral excavation which are time consuming and costly and depending on site conditions, may restrict economic use of a site.

In addition, excavations for inground foundations often are made at or below the water table which increases the need or an efficient means of waterproofing same.

We have now found a building structure and a method of forming a building structure which increases land use efficiencies and provides improved waterproofing.

Further objects and advantages of the present invention will become apparent from the ensuing description which is given by way of example.

Summary of the Invention

According to a first embodiment of the present invention, there is provided a building structure comprising a footing, wherein the footing includes a channel, and at least one panel, wherein the panel is located within said channel, wherein the footing is disposed on a waterproofing membrane which membrane extends along side walls of the footing and into said channel and wherein the panel has an external waterproofing membrane that

is in waterproof engagement with the membrane of the footing in the channel and wherein the waterproofing membranes comprise an absorptive clay disposed between water permeable layers.

In a second embodiment of the present invention there is provided a method of constructing a building structure comprising:

(a) laying footing over a waterproofing membrane;

(b) creating a channel in the footing;

(c) extending the waterproofing membrane of the footing into the channel;

(d) placing at least one panel in the channel wherein the panel has an external waterproofing membrane that is in waterproof engagement with the membrane of the footing in the channel and wherein the waterproofing membranes comprise an absorptive clay disposed between water permeable layers.

Detailed Description

The building structure of the present invention may be of any useful type built on foundations as will be apparent to those skilled in the art. In particular, the building structure of the present invention is particularly suited for inground foundations where the ground level extends partway up the side walls of the building. The building structure of the present invention is also useful in applications where the foundations are made at or below the water table and wherein the building is exposed to penetration by groundwater.

The building structure may be of the type having peripheral footings upon which the external walls are located and which support a suspended timber flooring above the ground. Another type of building structure that may be constructed according to the present invention is a slab construction wherein an overground foundation in the form of a concrete slab is laid with an integral peripheral footing. Such slab constructions are particularly advantageous when formed according to the present invention such that the waterproofing membrane can be disposed below the entirety of

the overground foundation and extend upwards to a peripheral channel that extends around the foundation.

The footing for use in the present invention is preferably a poured concrete footing in which the channel is formed integrally with the formation of the footing by the use of formwork and the like.

In a building formed using an overground foundation integral with the footing such as a slab construction, the channel is preferably sufficiently wide such that a spoon drain or the like may be provided on the inner sides of the panels. The spoon drains may be formed by filling the channel after the panels and other elements have been inserted within the channel with a cement based material in which a spoon drain or the like is formed.

In building structures having discreet footings, it may be preferable to form the channel sufficiently wide such that the panel can be received within the channel and that the waterproofing membrane extending from below the footing can be also received in the channel with the waterproofing membrane of the panel.

In the laying of the footing and overground foundation of a building structure having a concrete slab formation the waterproofing membrane may be laid upon the ground upon which the overground foundation is to be poured. The overground foundation may subsequently be poured and the waterproofing membrane which extends beyond the footings may be extended upwards along the side of the footings and into the channel. The waterproofing membrane may be cut such that the end of the membrane terminates at the base of the outer wall of the channel. The corners of the footings may be covered with waterproofing membrane by cutting the waterproofing membrane such that the membrane may be extended upwards over the sides of the footings in a manner that provides an overlap of the respective edges of waterproofing membrane. Preferably the overlap is of at least 100mm. The overlap may be fixed to the adjacent membrane by any convenient means or may be held in place by the soil or other earthen materials that surround the footing.

In building structures having discreet footings and which may support a suspended timber flooring, the waterproofing membrane may simply extend under the footings and to the bases of the respective inner and outer walls of the channel.

The panels may be of any convenient form. We have found that it is particularly convenient to use precast concrete panels which may be preformed and simply positioned in the channel in order to form the building structure. Whilst precast concrete channels are preferred for use in the present invention it will be apparent to those skilled in the art that the present invention envisages the use of other types of panels that may be either preformed or formed in situ.

The panels may be disposed directly on the base of the channel or preferably on a grout such that the panels are elevated above the base of the channel. Preferably strips of an absorptive clay are provided adjacent the base of the panel and, where a grout is used to maintain the panels above the base of the channel, the absorptive strips may be positioned along side the grout either underneath the panel or extending therefrom.

The panels have an external waterproofing membrane. The waterproofing membrane may be applied to the external face of the panel, or, in the case of a building structure having discreet foundations, the waterproof membrane may be applied to both sides of the panel. The waterproofing membrane may be formed integrally with the panel or applied to the preformed panel. Where the panel is formed in situ, the waterproofing membrane may be positioned within the channel and in waterproofing engagement with the waterproof membrane of the footing prior to the construction of the panel.

Where the panels are precast concrete panels, it is convenient that the waterproofing membrane be formed integrally with the panel. The precast panel may be formed with the waterproofing membrane already positioned on the outer face of the panel such that the panels may be simply lowered into the respective channels.

At the corner of the building structure, it is convenient to employ

precast panels with a return such that only flat wall joints are required between panels.

Flat wall joints between panels may be conveniently formed using a compression gasket on the inner wall of the panel and having an absorptive clay member disposed between the adjacent panels. Preferably the adjacent panels have the waterproofing membrane extending around to the sides of the adjacent panels such that a waterproof engagement is formed between the adjacent panels by the engagement of the respective waterproofing membranes with the absorptive clay member. The absorptive clay member may be held in place by a convenient bead such as a backing rod.

The waterproofing membranes for use in the present invention comprise a layer of absorptive clay disposed between water permeable layers. The absorptive clay may be of any convenient formulation, preferably a bentonite based material. Bentonite is particularly advantageous as it swells considerably when exposed to water, making it ideal in the formation of a self healing waterproof membrane. It will be appreciated by those skilled in the art that other absorptive clays may perform analogously to bentonite, if not to the same extent. Bentonite is a clay like mineral consisting largely of montmorillonite and is often derived from volcanic ash.

Whilst a variety of water permeable layers may used to contain the absorptive clay, it is preferred that a woven geotextile be used as suitable woven geotextiles are both tough and abrasion resistant and can withstand the abrading forces generally encountered in the formation of a building structure.

Advantageously we have found that by the use of the building structure of the present invention, the need to over-excavate is substantially reduced or eliminated as there is no longer a requirement to access the external side of the wall as the panels may be placed in situ with the waterproofing membrane in place. As such, it is possible to allow for the maximum utilisation of the building site as there is no need to allow space for the over-excavation of the walls.

As a result of the use of the building structure of the present invention a dramatic reduction in the construction program for the basement work may be achieved. We have found that up to 50% of the work required to construct the basement of a building structure may be saved. In addition, the requirement for a variety of trades may be reduced or eliminated. We have found that it is possible to reduce or eliminate the need for concreters, form workers, steel fixers and waterproofers.

The building structure of the present invention may be produced in a manner which permits the saving of a variety of other services such as water, electricity, cranage and the like. In addition the need for onsite storage and accommodation may be reduced.

The present invention will not be described with reference to the following non-limiting drawings in which:

Figure 1 is a cross-sectional side view of a foundation and panel structure of a building structure according to one embodiment of the present invention;

Figure 2 is a cross-sectional view of a panel joint between adjacent panels in a building structure as shown in Figure 1;

Figure 3 is a cross-sectional view of a foundation and panel of a building structure according to another embodiment of the present invention;

Figure 4 is a cross-sectional view of a joint between adjacent panels according to the embodiment shown in Figure 3.

Figure 1 shows an above ground raft foundation 1 having a footing 1a. On the upper surface of the footing 1a is channel 2 which extends around the periphery of the raft foundation 1. Precast panel 3 is positioned in an upright position within channel 2.

The foundation 1 is laid upon a waterproof membrane 4a that extends below the raft foundation 1 and up the edge of the footing 1a and into channel 2. The waterproof membrane is terminated at the base of channel 2.

Precast panel 3 includes a waterproof membrane 4b that is attached to panel 3 by a suitable flashing 9. The waterproof membrane 3 extends down into channel 2 adjacent the waterproof membrane 4a. Any gap

between the respective membranes may be filled with an additional absorptive clay, such as bentonite, filler so as to provide a waterproof engagement between the respective waterproof membranes. The waterproof membranes are formed by sandwiching an absorptive clay, such as bentonite, between two layers of geotextile fabric.

The panels 3 are positioned on top of a structural grout 7 so as to maintain the panels at a desired height above the base of channel 2. Bentonite strips 8 are positioned adjacent the structural grout to provide improved waterproofing properties.

A spoon drain 8a is formed on the inside of the panel by a concrete mix 8b.

Figure 2 shows the joint between adjacent panels 3. Adjacent panels 3 have respective waterproof membranes 4 on their outer surface and include a groove 12 on their adjacent lateral surfaces. A PVC sheet 15 slides between the respective panels 3 and is engaged by an expanding bentonite strip 13. The expanding bentonite strip 13 is positioned immediately adjacent the PVC sheet and retained in position using a compression gasket 14 as described in international application no. PCT/AU02/01381.

Figure 3 shows a building structure according to a second embodiment of the present invention. A raft concrete slab foundation 21 is laid upon a waterproofing membrane 22 that extends under the slab foundation, and the footing 21b, up the sidewall of the footing 21b and into channel 23. A precast concrete panel 24 is positioned vertically within channel 23. The precast concrete panel 24 includes an integral waterproofing membrane 25 that is formed integrally with the panel 24. The fibres of the geotextile material used to form the waterproofing membrane are advantageously embedded in the concrete of the precast panel 24 to retain the waterproofing membrane 25 in position.

The panel 24 is located on structural grout 26 which is itself sandwiched between bentonite strips 27. The inside part of the channel 23 is filled with a concrete material 28 to form a spoon drain 29 such that any water inside the building structure may be drained therefrom.

Figure 4 shows a wall joint according to the second embodiment of the present invention. The wall joint 30 is between respective precast panels 24. The precast panels 24 have a integral waterproofing membrane 25 formed on the outer surface of the panel 24 and extending onto the lateral surface 26 of the panels 24. A backing rod 27 is positioned between the respective panels 24 to provide a solid engagement therebetween. A bentonite strip 28 is disposed adjacent the rod 27 and between the respective panels 24 such that the waterproofing membranes 25 are in a waterproofing engagement with the bentonite strip 28. A compression gasket 29 is used to retain the bentonite strip within the joint 30.

Aspects of the present invention have been described by way of example only and it would be appreciated by those skilled in the art that modifications, additions and alterations thereto may be made without departure from the spirit or scope of the invention.